1764

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Gregory L. Townsend, et al.

Serial No.: 10/092,956

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For: **APPARATUS FOR MIXING ACID AND BASE**

Group No.: 1764

Examiner: Jennifer A. Leung

Mail Stop Non-Fee Amendment
Commissioner for Patents
P. O. Box 1450
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Sir:

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RESPONSE

Responsive to the Office Action dated May 19, 2003, and having a shortened statutory period for response expiring August 19, 2003, please amend the Application as follows:

In the specification:

Paragraph 2:

[0002] To produce large quantities of such versatile compounds, acid and base chemicals can be mixed together within a vented reaction chamber. The chamber cannot be enclosed, ~~it will blow up like a big bomb~~. It may explode if it is not vented. However, the extreme exothermic reaction produces excessive heat within the chamber. Because heat can catalyze undesirable side reactions within any given mixture, it is of critical importance that the temperature of a mixing chamber

should be controlled precisely. For example, in acid/base mixtures, the excessive heat may be so large that the mixture is uncontrollable and certainly irreproducible from one batch to another. There are few methods that can be employed to regulate the temperature in a reaction chamber. For example, a heat transfer system may be used to govern the rapidly changing temperature within the chamber. Conventionally, heating and cooling jackets, such as those connected to a heat exchanger have been used to control the temperature of the reaction chamber. Additionally, regulating the introduction rate of chemicals (e.g. the acid) into the chamber can be utilized to moderate increased temperature within the chamber.

Paragraph 6:

[0006] One embodiment of the present invention relates to an apparatus for blending an acid and a base to form a mixture. The apparatus comprises a chamber having a distribution-blending-cooling dish suspended therein, an acid delivery system for introducing the acid into the chamber and to the distribution-blending-cooling dish, and a base delivery system for introducing the base into the chamber via the distribution-blending-cooling dish. The apparatus allows an acid (e.g. sulfuric acid) and a base (e.g. calcium hydroxide in the form of a slurry) ~~the calcium hydroxide could be sprayed, dry, into the dish as in the method used to spray powdered paint or to spray powdered metal~~ to be sprayed into the chamber to utilize in-air mixing. <u>The calcium hydroxide could also be sprayed, dry, into the dish as in the method used to spray powdered paint or to spray powdered metal.</u> The acid/base spray that does not mix in-air forms a thin layer on the distribution-blending-cooling dish. The distribution-blending-cooling dish is of an adequate size and shape to allow broad distribution of the acid/base components. Additional *in situ* mixing occurs within the chamber below the distribution-blending-cooling dish. The *in situ* mixing occurs via a vortex generator that is described in a preferred embodiment of the invention. Additional features of the preferred apparatus include a non-corrosive compound (e.g. ethyl tetraflouro ethylene which is a fluor-polymer as in DuPont's Teflon™, which is tetrafluoroethylene, a fluorocarbon polymers, or fluorinated ethylene-propylene) coating on the inside surface of the chamber and on the surface of the distribution-blending-cooling dish and on all chemical contacting surfaces.

Paragraph 25:

[0025] In the illustrated embodiment, the acid delivery system 130 can introduce the acid into different areas of the chamber 110, including below the distribution-blending area ~~222~~ or the distribution-blending-cooling dish 120 (discussed below), wherein the acid is diluted with water to give a predetermined result of diluted acid. The distribution-blending area is the area wherein the acid and base sprayers are shown mixing ~~222~~. In another embodiment, the distribution-blending-cooling dish 120 is added. The diluted acid can be removed from the chamber 110, forced through a pump 140, returned to the acid spray nozzle or nozzles 142 and sprayed into the distribution–blending area ~~222~~ or above the distribution-blending-cooling dish 120. Additionally, the pump 140 can be further adapted to create a vortex in the diluted acid within the chamber 110 to enhance the blending as explained above. The acid is injected into the mix tank via a small nozzle placed strategically above one of the eductors or injectors. This insures a though mixing of the acid and helps control heat. An optional embodiment of the present invention involves one or more injectors or eductors that are pointed at 45 to 90 degrees to the centerline to defuse the vortex.

Paragraph 27:

[0027] The apparatus 100 further includes a base delivery system 150 for introducing the base into the chamber 110 via the distribution-blending area ~~222~~ or distribution-blending cooling dish 120. The base delivery system 150 includes a base reservoir/metering system 152 that contains the base. In one such embodiment, the base is in powder form and is delivered to the chamber 110 as a powder, which is similar to a powder painting system utilizing a nozzle. In another embodiment, the powdered base is made into a slurry mixture in the base reservoir 152. Specific embodiments of the current invention that contain a slurry mixture are comprised of a predetermined amount of base material that is introduced to the base reservoir 152 and mixed with a predetermined amount of water. The slurry mixture system also includes a pump 155 coupled to the base reservoir that first mixes the base and water and subsequently re-circulates the slurry mixture to keep the non-soluble solids suspended until the slurry is delivered to the chamber 110.

Paragraph 32:

[0032] The base delivery system 150 further includes a base spray nozzle(s) 166 for spraying the base into the chamber 110 in the distribution-blending area ~~222~~ or above the distribution-blending-cooling dish 120. Since the base pump 164 may vibrate and cause a pulsating delivery stream, the base delivery system 150 of the present invention allows a volume of air to pass through a vortex formed by the operation of the base peristaltic pump 164, and to an inlet of a head of the base peristaltic pump 164. The air forms a cushion, which may dampen the pulsation in the delivery stream. By controlling the volume of air allowed into the vortex, the non-soluble particle suspension may be regulated to allow substantially uniform suspension of solids and delivery of the base into the chamber 110.

Paragraph 45:

[0045] In another embodiment, the acid and base are introduced into the distribution-blending area ~~222~~ via the acid delivery system 130 and base delivery system 150, respectively. Following the acid/base mixing in the distribution-blending area ~~222~~, the acid/base mix is re-circulated by a high shear force pump 140. In this embodiment, pump 140 is adapted to apply a high shear force to the acid/base mix as it is pumped back to the acid spray for further mixing in the chamber 110. The shear force will breaks-up most of the encapsulated material from a previous mixing of the acid and base reaction, which assures more efficient mixing. A batch mix can be re-circulated many times to ensure a more uniform final product.